EXHIBIT A

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[54] **METHODS OF AND APPARATUS FOR PROVIDING TELEPHONE CALL CONTROL AND INFORMATION**

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[51] **Int. Cl.**^{7} **H04M 3/42**

[52] **U.S. Cl.** **379/201**; 379/93.23; 379/216; 379/242; 379/355; 370/352

[58] **Field of Search** 379/201, 209, 379/215, 265, 93.35, 216, 202, 203, 204, 205, 93.24, 242, 93.23; 370/352, 355

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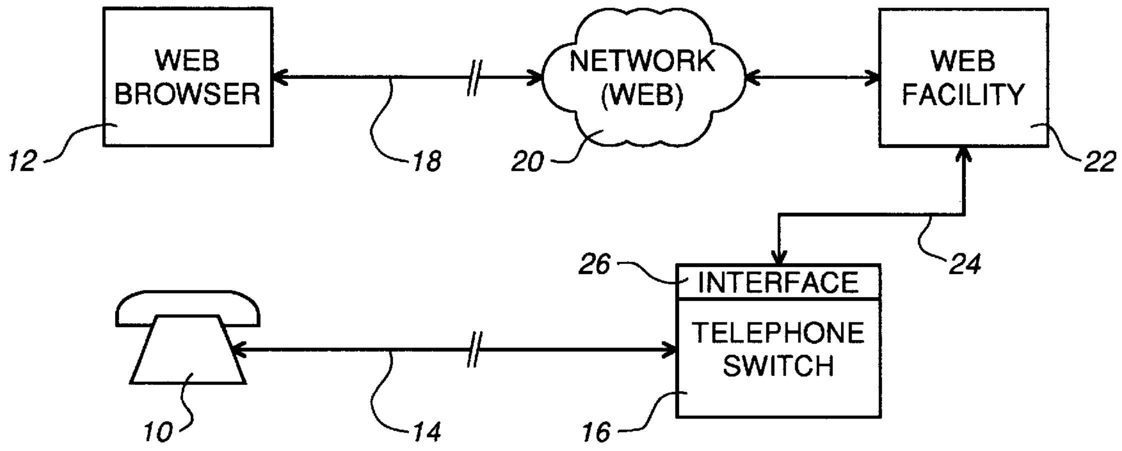
[57] **ABSTRACT**

Telephone call management is provided via a computer network (web) facility which can be remotely accessed by subscribers using web browsers. The web facility includes an information database for storing personal telephone directories and call logs, and a telephone call control system coupled to a telephone switch via a switch-computer interface. Information on calls to and/or from telephone numbers of subscribers is communicated from the switch to the web facility to be stored in the database without requiring the subscribers' browsers to be active. Subscribers can make telephone calls and control telephone communications via the browsers and the web facility. Subscribers do not require any hardware or software in addition to a telephone and web browser.

14 Claims, 2 Drawing Sheets



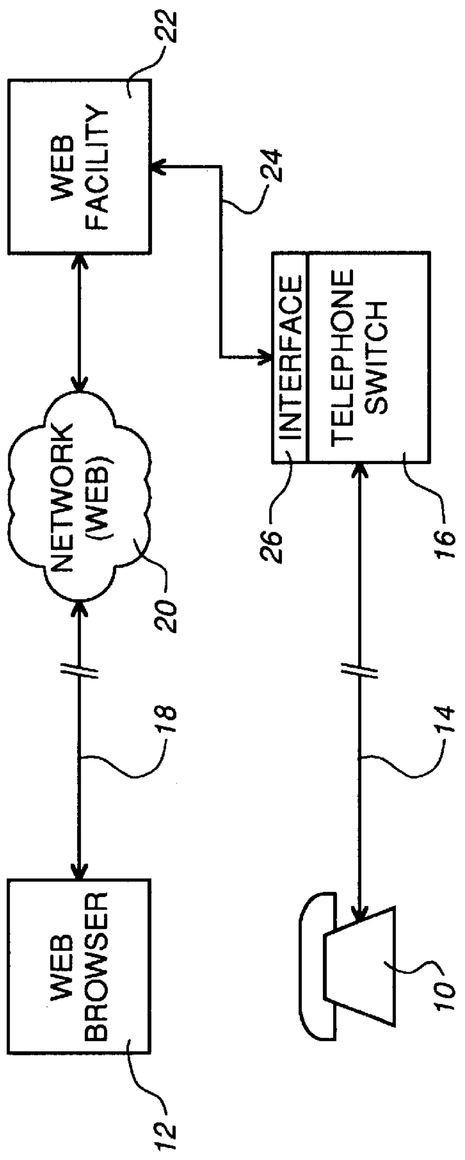

WEB BROWSER
12
18
NETWORK (WEB)
20
WEB FACILITY
22
24
INTERFACE
TELEPHONE SWITCH
26
16
14
10

Fig. 1

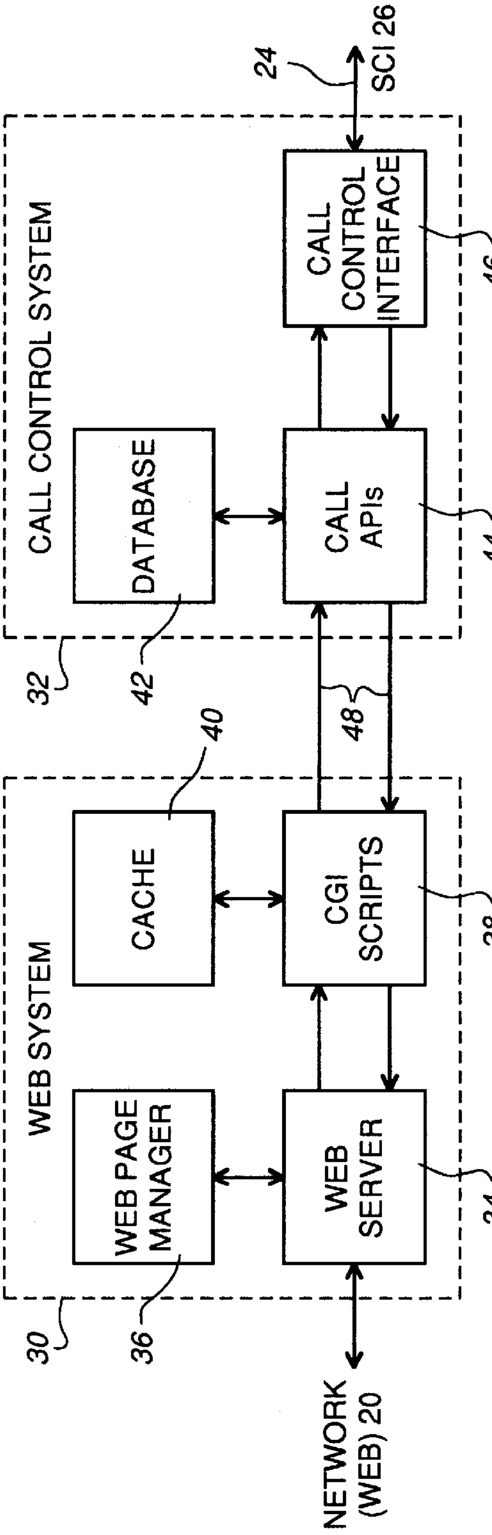

WEB SYSTEM
30
WEB PAGE MANAGER
36
WEB SERVER
34
CACHE
40
CGI SCRIPTS
38
48
CALL CONTROL SYSTEM
32
DATABASE
42
CALL APIs
44
CALL CONTROL INTERFACE
46
24
SCI 26
NETWORK (WEB) 20

Fig. 2

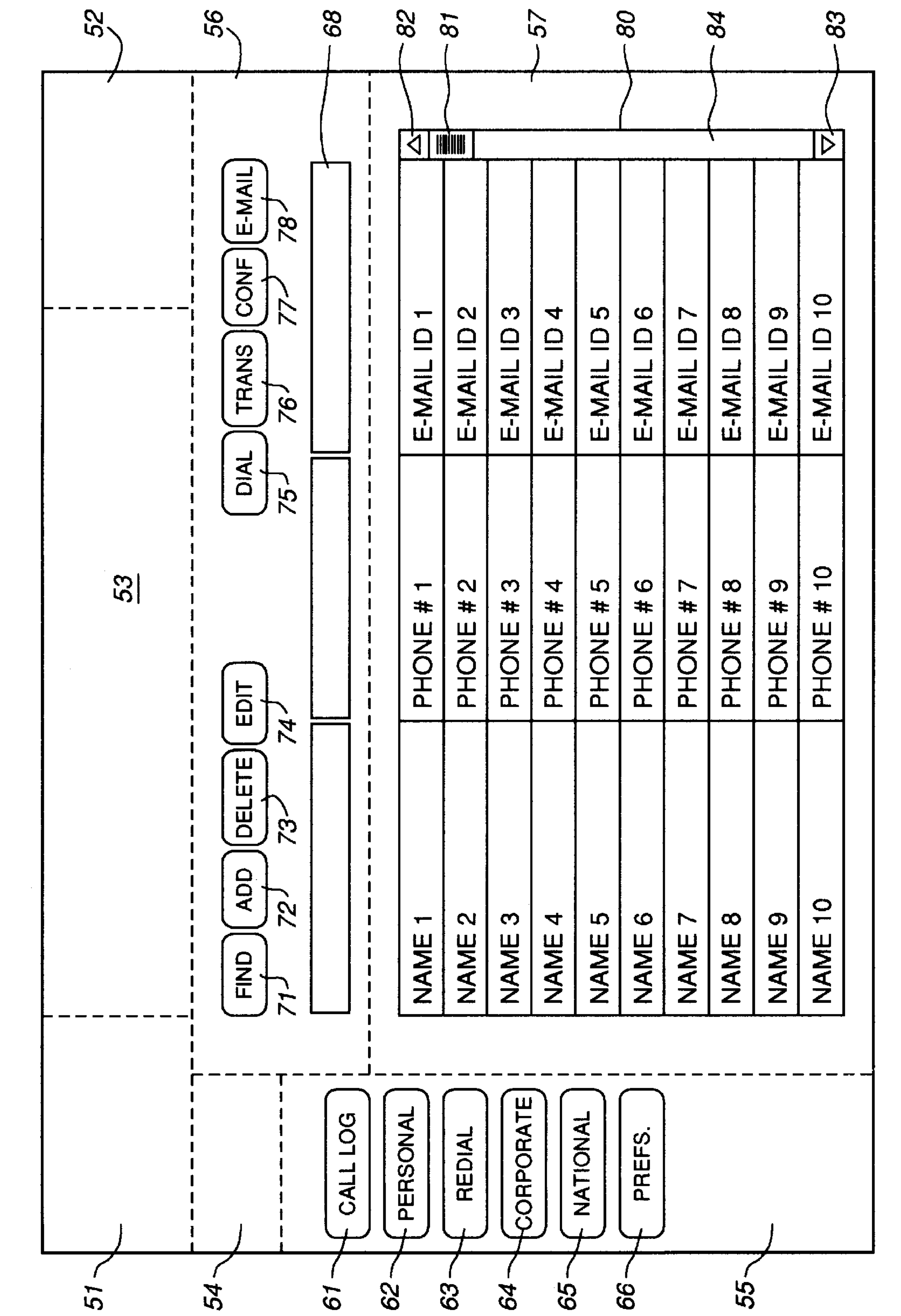

FIND
ADD
DELETE
EDIT
DIAL
TRANS
CONF
E-MAIL
NAME 1
NAME 2
NAME 3
NAME 4
NAME 5
NAME 6
NAME 7
NAME 8
NAME 9
NAME 10
PHONE # 1
PHONE # 2
PHONE # 3
PHONE # 4
PHONE # 5
PHONE # 6
PHONE # 7
PHONE # 8
PHONE # 9
PHONE # 10
E-MAIL ID 1
E-MAIL ID 2
E-MAIL ID 3
E-MAIL ID 4
E-MAIL ID 5
E-MAIL ID 6
E-MAIL ID 7
E-MAIL ID 8
E-MAIL ID 9
E-MAIL ID 10
CALL LOG
PERSONAL
REDIAL
CORPORATE
NATIONAL
PREFS.
51
52
53
54
55
56
57
61
62
63
64
65
66
68
71
72
73
74
75
76
77
78
80
81
82
83
84

Fig. 3

METHODS OF AND APPARATUS FOR PROVIDING TELEPHONE CALL CONTROL AND INFORMATION

This invention relates to methods of and apparatus for providing telephone call control and information.

BACKGROUND OF THE INVENTION

It is well known to provide relatively sophisticated telephone call control and information features using a subscriber's telephone. Some examples of telephone call control features are dialling of stored numbers, redialling of previously dialled numbers, three-way calling, and call forwarding. Examples of telephone information features are calling number display, calling number logs, and call waiting messages. Numerous other examples of call control and information features exist.

Providing such features using the subscriber's telephone involves several disadvantages. For example, the telephone must be capable of providing the required control input and information display functions, so that it becomes a relatively complicated and expensive device. As further call control and information features are developed and become available, the telephone may be unable to accommodate them so that it must be replaced or upgraded to permit use of these further features. Even when the necessary functions are present in the telephone, use of the various functions is not generally simple or intuitive, typically requiring the subscriber to enter various number sequences and/or to interpret relatively cryptic displayed messages. Furthermore, these functions are limited to each individual telephone device, and they must be provided separately for different telephone devices.

Some of these disadvantages have been avoided or reduced by the use of computer-telephone integration (CTI) software which is run on a subscriber's computer in association with telephone control hardware such as a modem or telephone dialler. Such software can facilitate the display of information to, and the input of control information by, the subscriber, and in addition to the features discussed above can facilitate the provision of other features such as telephone directories and voice massaging. However, these CTI arrangements also have several disadvantages. In particular, they require the use of a computer, software, and telephone control hardware by the subscriber, and the computer system must be running continuously to collect information on incoming calls. In addition, such arrangements only provide information at the location at which the system is installed.

More sophisticated arrangements are also known for use with private branch exchange (PBX) and key system telephone networks deployed over a local area network (LAN), with similar disadvantages.

It is also known to provide so-called web call center applications. In this case a subscriber uses a web browser, which for example may be constituted by software running on the subscriber's computer system, to access a computer network such as the international computer network generally referred to as the Internet or World Wide Web, which for brevity is referred to below simply as the web. On browsing a company's web site and desiring to talk with a customer representative of the company, the subscriber can enter his name and telephone number into an HTML (hypertext markup language) page and click on a "submit" button, in response to which the company's telephone system initiates a telephone call from an available representative back to the subscriber. Such call center applications do not provide the telephone call control and information features discussed above.

An object of this invention is to provide improved methods of and apparatus for providing telephone call control and information.

SUMMARY OF THE INVENTION

According to one aspect, this invention provides a method of making a telephone connection comprising the steps of: remotely accessing a computer network facility to produce at the computer network facility a telephone connection message including information identifying calling and called telephone numbers; communicating the telephone connection message from the computer network facility to a telephone switch via a switch-computer interface; and establishing a telephone connection between the calling and called telephone numbers from the switch in response to the telephone connection message.

The step of establishing a telephone connection preferably comprises the step of providing a ringing signal to a telephone identified by the calling telephone number.

Preferably the step of remotely accessing the computer network facility comprises providing telephone number information from the computer network facility for remote display to a subscriber identified by the calling telephone number. The telephone number information can comprise a personal telephone directory of the subscriber, and logged information relating to telephone communications to and/or from the calling telephone number. The step of remotely accessing the computer network facility conveniently comprises operating a web browser.

Thus the invention enables subscribers to control telephone connections, and obtain information from telephone directories and call logs, using a web browser without any need for extra hardware to couple the browser to the telephone. Call logs are maintained without requiring the browsers of the subscribers to be active. In addition, the web or computer network facility can be accessed by each subscriber from any location with web access facilities.

Another aspect of the invention provides a telephone call management system comprising: a computer network facility including a server for communications with telephone subscribers, an information database, and a telephone call control system; a telephone switch including a switch-computer interface; and a communications path between the telephone call control system of the computer network facility and the switch-computer interface of the telephone switch; wherein information relating to telephone communications to and/or from telephone numbers of subscribers is communicated via the communications path from the telephone switch to the computer network facility and being stored in the database, and information for controlling telephone communications is communicated via the communications path from the computer network facility to the telephone switch in response to remote access by subscribers to the information database via the server of the computer network facility.

The invention also provides a method of telephone call management, comprising the steps of: storing personal telephone directories and call logs of telephone subscribers for remote access by the subscribers via a web facility; supplying information, relating to at least some telephone communications associated with the telephone subscribers, from a telephone switch to the web facility; updating the personal telephone directories and call logs of the telephone subscribers in dependence upon information supplied by the subscribers by the remote access via the web facility and the information supplied from the telephone switch; and supplying information from the web facility to the telephone switch, for controlling telephone communications for the subscribers via the telephone switch, in response to the remote access by the subscribers via the web facility.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be further understood from the following description with reference to the accompanying drawings, in which:

FIG. **1** is a block diagram schematically illustrating an arrangement in accordance with an embodiment of the invention;

FIG. **2** is a block diagram schematically illustrating one form of a web facility of the arrangement of FIG. **1**; and

FIG. **3** illustrates an example of a web page layout which can be provided in the arrangement of FIGS. **1** and **2**.

DETAILED DESCRIPTION

Referring to FIG. **1**, in an arrangement in accordance with an embodiment of the invention a telephone subscriber has at least one telephone **10** and a web browser **12**. The telephone is coupled via a path **14** to a telephone switch **16**, and the web browser is coupled via a path **18** to a network **20** constituting the web (Internet or World Wide Web). The forms of the telephone **10**, web browser **12**, and paths **14** and **18** are entirely arbitrairy, and these can be known or yet to be devised. The telephone switch **16** can be a central office (C.O.) forming part of the public switched telephone network (PSTN), or a PBX or telephone key system which is coupled to the PSTN in a known manner.

For example, the telephone **10** can be a conventional telephone with pulse or DTMF (dual-tone multi-frequency) dialling, with or without any additional functions for control or information display, coupled to the telephone switch **16** via a twisted wire pair constituting the path **14**. For the purposes of this invention, it is observed that even the dialling function of the telephone **10** is not essential and can be dispensed with (although it would of course be required for conventional use of the telephone **10**). Alternatively, the path **14** could be provided via an ISDN (integrated services digital network) line or any other telephone communications path. With wireless communications, the telephone **10** can be a fixed or mobile telephone.

The path **18** can also be of any known or desired form, for example comprising a wireline or wireless data communications path which may be the same as or separate from the path **14**. Likewise, the form of the web browser **12** is entirely arbitrary. For example it may comprise a personal computer executing browser software in known manner, or a dedicated network browsing device, or a web browsing function integrated within another device such as a video game device or a television receiver or other communications device. Similarly, the functions of the web browser **12** and telephone **10** can be integrated into a single unit, with or without other functions, in any desired manner.

Thus there are numerous ways in which the telephone **10** and web browser **12**, and their paths **14** and **18**, can be implemented, for example including a conventional telephone and personal computer executing browsing software coupled via separate twisted wire pair telephone lines (or via a single telephone line using multiplexed communications) to the telephone switch **16** and web **20**, or an integrated mobile unit combining voice communication and network browsing functions coupled via wireless (e.g. infra-red or radio) communication paths to the web and the PSTN.

The arrangement of FIG. **1** also includes a web facility **22** that is coupled to, and thus can be considered as forming part of, the web **20**. Details of the web facility **22** are described below. The web facility **22** is also coupled via a path **24** to a switch-computer interface (SCI) **26** which forms part of the telephone switch **16**. The path **24** for example comprises a communications path providing X.25 communications between the web facility **22** and the SCI **26**, but it can alternatively comprise any other desired form of communications path, including for example an Ethernet communications path via the network or web **20**.

The SCI **26** is a known facility that is provided by the supplier of the telephone switch **16**. For example, in the event that the telephone switch is a DMS™ telephone switch available from Northern Telecom Limited, then the SCI **26** is constituted by CompuCALL™ facilities also available from Northern Telecom Limited for that switch. Other forms of SCI are available for other telephone switches. The interface **26** can use any of a variety of protocols, such as SCAI (Switch-Computer Access Interface), SPI (Service Programming Interface), or OAP (Open Automated Protocol). In addition, higher level interfaces, such as TSAPI (Telephony Server Application Programming Interface), TAPI (Telephony Application Programming Interface), or JTT (Java Telephony Toolkit) can be implemented in the SCI **26**, or in the CCI **46** described below. In any event, the SCI **26** provides on the path **24** information about telephone calls to telephone lines or directory numbers handled by the switch, and can also control the switch in response to control information supplied via the path **24** to establish calls as described further below.

The web facility **22** provides an interface to the subscriber, via the web **20**, path **18**, and browser **12**, in the form of one or more web pages that enable the subscriber to manage at least some and preferably all telephone functions for the telephone **10**. These functions for example can include all of the functions referred to in the introduction, some of which are further discussed below, as well as other functions which may be desired. To this end, the web facility **22** also communicates call control signals and information relating to these telephone functions with the telephone switch **16** via the path **24** and the SCI **26**.

Accordingly, the web facility **22** constitutes a web server interface for subscriber information and call management functions, and can have any form that enables these functions to be provided and that provides corresponding communications with the telephone switch **16** via the path **24** and SCI 26. FIG. **2** illustrates by way of example one form of the web facility **22**. This form of the web facility **22** comprises two computer systems, shown in FIG. **2** within dashed-line boxes and referred to below as a web system and a call control system **32**. By way of example, the web system **30** may comprise a Windows NT™ computer system and the call control system **32** may comprise a DEC Alpha 2100™ computer system.

The division of the web facility **22** between the two computer systems **30** and **32** is convenient for providing a security firewall between the public network **20** to which the web system **30** is connected and the private data within the computer system **32**, but all of the functions of the web facility **22** could alternatively be provided on a single computer system.

The web system **30** supports a web server **34**, a web page manager **36**, CGI (Communications Gateway Interface) scripts **38**, and a cache (working data storage) **40**. The web system **30** may also support an advertisement server (not shown). The web server **34** and advertisement server are commercially available software applications which need not be described further here. The web page manager **36** is a software application that manages the presentation of the call management web pages to the subscriber via the web **20**, and that can easily be provided in known manner to provide any desired web page appearance. Purely by way of example and illustration, FIG. **3** shows one possible appearance of a call management web page, and this is further described below. The CGI scripts **38** are software procedures that receive high-level calls from the web server **34** and translate these into lower level operations to be executed in conjunction with the cache **40** and the call control system **32**, with parameters being passed to and from the CGI scripts accordingly.

The call control system **32** supports a database **42**, call APIs (Application Program Interfaces) **44**, and a call control interface **46**. The call control interface **46** is a commercially available product, such as Genesys T-Server™, that provides a network or direct interface via the path **24** to the SCI **26** of the telephone switch **16**. The call APIs **44** communicate with the CGI scripts **38** of the web system **30** via paths **48**, and translate CGI script operations into low level operations comprising calls to and from the call control interface **46** and the database **42**. Thus the CGI scripts **38** and call APIs **44** simply provide successively lower level procedures or software routines for handling calls between the web page manager **36** running on the web server **34**, the call control interface **46**, and the database **42** and cache **40**. The database **42** comprises, for example, a commercially available database manager using SQL (structured query language) in a known manner.

The paths **48** are shown in FIG. **2** for convenience as direct paths between the CGI scripts **38** and the call APIs **44**, but they are preferably constituted by InternetProtocol paths communicating remote procedure calls between these units.

Referring to FIG. **3**, one possible appearance of a call management web page provided by the web facility **22** is illustrated. It is emphasized that this, and the following description of call management functions which can be provided, are given purely by way of example and explanation, and the invention is not in any way limited to these examples or the manner in which they are provided.

As shown by dashed lines in FIG. **3**, the web page is divided into frames which are referenced **51** to **57**. The frames **51** and **52** can be used to display logos relating to the call management service and its provider, and the frame **53** can be used to display an advertising banner. The advertising banner can be provided by an advertisement server on the web system **30** as indicated above or externally of the web facility **22** elsewhere on the web **20**. The manner in which advertising banners are called, provided, and displayed is well known in the art and need not be described here.

The frame **54** can be used to display data relating to the subscriber, for example his name, telephone number, and e-mail ID (electronic mail identity), when he is logged on, and otherwise to display a message indicating that the subscriber is not logged on. The frame **55** provides a number of function buttons **61** to **66**, each constituting a hypertext tag in known manner, functions of which can be as described below.

The frame **56** provides editing windows **68** and buttons **71** to **78**, each constituting a hypertext tag, of which the buttons **71** to **74** provide directory functions and the buttons **75** to **78** provide communication functions as described below. The frame **57** provides contents dependent upon the functions selected by the buttons **61** to **66**, as further described below.

On initially accessing the web facility **22**, the web page manager **36** produces the web page for example with logos in the frames **51** and **52**, an advertising banner obtained from the advertisement server in the frame **53**, and with the frame **57** presenting options (e.g. function buttons and/or editing windows) to permit the subscriber to register or log in. On logging in, the web page manager **36** communicates via the functions **38** and **44** to retrieve data for the subscriber from the database **44** and store this data in the cache **40** for convenient and rapid access. This data can include subscriber information which the page manager **36** then displays in the frame **54** as indicated above, preferences previously stored for the subscriber, and personal directories and call data as discussed further below. The page manager **36** then can also present the frames **55** and **56** for example as shown in FIG. **3**, with the frame **57** being blank or containing any desired information.

On clicking the button **62** labelled PERSONAL, via the function **38** the web page manager **36** accesses a personal directory of the subscriber and displays this in a conventional scrolling window **80** within the frame **57**. For example as shown in FIG. **3** each entry in the personal directory can have name, telephone number, and e-mail ID fields which are displayed in the window **80**. A slider **81**, arrows **82** and **83**, and scroll bar **84** permit the subscriber to scroll through the personal directory records. Clicking on any record causes the fields of that record to be reproduced in the editing windows **68**, where the record can be edited and updated by clicking on the button **74** labelled EDIT. A record identified in the windows **68** can be deleted from the personal directory by clicking on the button labelled DELETE. A desired record can be located by the subscriber entering search criteria in the windows **68** and clicking on the button **71** labelled FIND, and new records can be created in the personal directory from the windows **68** by the subscriber clicking on the button **72** labelled ADD. In this manner, via the web page manager **36** and the CGI scripts **38**, the subscriber can set up and maintain the personal directory in the cache **40**. Updating of the database **42** from the cache **40** can be carried out as desired in the background in a known manner.

The above functions of the buttons **71** to **74** do not involve communications via the call control interface **46**. In contrast, the buttons **75** to **77** invoke communications functions which typically involve communications with the telephone switch **16** via the call control interface **46**. For example, clicking on the button **75** labelled DIAL triggers the telephone switch **16** to set up a telephone connection between the subscriber's telephone **10** and a telephone directory number in the windows **68**. This number can be entered and optionally edited by the subscriber by typing at the network browser **12**, selected from the personal directory by clicking on a record in the window **80** as described above, or provided in another manner for example as described further below.

On clicking the DIAL button **75**, the web page manager **36** communicates a message, containing a dial request, a calling telephone number CN of the subscriber (as displayed in the frame **54**), and a called telephone number DN from the windows **68**, via the functions **38** and **44** to the call control interface **46**, via which this message is forwarded via the path **44** and SCI **46** to the telephone switch **16**. The switch **16** checks validity of the telephone numbers and that the subscriber's telephone **10** (calling telephone number CN) is on-hook, and provides a (possibly distinctive) ringing signal to the telephone **10**. The subscriber, expecting this ring signal, takes his telephone **10** off-hook, and this is detected by the telephone switch **16** in conventional manner, in response to which the switch **16** sets up the desired telephone connection to the called number DN in the same manner as if the number DN had been dialled by the subscriber at the telephone **10**. Error and/or status messages can be communicated from the telephone switch **16** via the SCI **46**, path **44**, and functions **46**, **44**, and **38** to the web page manager **36**, and displayed on the web page, as desired and appropriate.

It can be appreciated that, in the manner described above, the subscriber is able to instigate a telephone call to a desired number through his access to the web page, and not by dialling at the telephone **10**.

In a corresponding manner, the subscriber can transfer an existing telephone call at his telephone **10** to another called number DN in the windows **68** by clicking the button **76** labelled TRANS. The web page manager again communicates the numbers CN and DN, with a call transfer request, to the telephone switch **16** via the functions **38**, **44**, **46**, and **26**, in response to which the switch **16** transfers the call from the telephone **10** (CN) to the called number (DN) and provides error and/or status messages to the web page manager **36** accordingly. Likewise, the subscriber can establish a conference connection to add another called number DN from the windows **68** to an existing telephone call at his telephone **10** by clicking the button **77** labelled CONF. The web page manager again communicates the numbers CN and DN, with a conference request, to the telephone switch **16** via the functions **38**, **44**, **46**, and **26**, in response to which the switch **16** establishes a conference connection of the call involving the telephone **10** (CN) with the additional called number (DN, again providing en-or and/or status messages to the web page manager **36** accordingly.

In response to clicking on the button **78** labelled E-MAIL, the web page manager **36** creates in known manner a window for the subscriber to enter an e-mail message to an e-mail ID from the window **68** or entered by the subscriber in the e-mail window, this being transmitted in known manner via the web **20**. In this manner, electronic mail communications can also be established by the subscriber using the same web interface as for telephone voice communications. Other communications facilities, for example voice mail messages, and other telephony functions, can be similarly provided in analogous manner to the specific examples given above.

For telephone calls incoming to the telephone **10** via the telephone switch **16**, the SCI **26** provides to the web facility **22** information messages containing for example the called and calling numbers, and the date and time of the call. This information is entered by the call APIs **44** into a call log for the respective subscriber in the database **42** via the functions **46** and **44**. This takes place whether or not the subscriber's web browser **12** is active, so that the call log is not dependent on any activity of the subscriber. On log-in to the web page, the call log is supplied to the cache **40** as described above and is available to the subscriber. The subscriber can click the button **61** labelled CALL LOG, in response to which the web page manager **36** displays the call log in a scrolling window in the frame **57** in place of the personal directory. Each record in the call log can for example include a field containing the calling telephone number (e.g. as in the personal directory described above) supplied from the telephone switch **16** via the SCI **26**, a field for a name which can be optionally provided either similarly by the telephone switch **16** by look-up from the calling telephone number, using the subscriber's (i.e. the called number's) personal directory via the database **42** or using other directory facilities such as a corporate directory as discussed below, and a field for the date and time of the call. Other fields, for example for the duration and status (e.g. answered or not) of the call provided by the SCI **26**, and an associated e-mail address as described above and also provided by the database or directory lookup, can also be provided in the call log as desired.

In a similar manner to that described above for the personal directory, the subscriber can scroll through the call log, click on any record to reproduce it in the windows **68**, click on the ADD button **72** to add a corresponding record to the subscriber's personal directory, click on the DIAL button **75** to establish a return call to the calling number, etc.

For alerting the subscriber to an incoming telephone call, a ringing signal is supplied to the telephone **10** in conventional manner. In addition, if the subscriber's web browser (or a sub-set of this such as a Java applet) is active, then the web page manager **36** is supplied with information about the call (e.g. calling number, name, etc. as provided for the call log as described above) via the functions **44** and **38** and provides an informative alert to the subscriber's web page (or applet window). This obviates the need for processing and display facilities in the telephone **10** to provide call information.

Correspondingly, the web facility maintains a called number log, of numbers called by the subscriber. Conveniently this can be similar to the call log described above, and for calls established by the subscriber using the web facility can use information supplied from the web page manager **36** and/or information supplied by the switch **16** via the SCI **26** as described above for incoming telephone calls to the subscriber. The latter information can also be used to maintain this called number log even for calls made in conventional manner from the telephone **10** without use of the web facility **22**, so that the subscriber's web browser **12** does not need to be active for this called log to be maintained. In the same manner as described above for the call log, the subscriber can click on the button **63** labelled REDIAL to display the called number log in a window in the frame **57**, and again the windows **68** and buttons **71** to **78** in the frame **56** can be used by the subscriber to maintain the called number log and, using the DIAL button **75**, to redial previously called numbers.

A directory of employees of a corporation can be maintained by the web facility **22**, for example as part of the database **42**, and can be used as described above to determine names and other information corresponding to supplied telephone numbers. In addition, such a directory can be used generally by the subscriber using the web facility **22**. In response to the subscriber clicking the button **64** labelled CORPORATE, the web page manager **36** in this case presents in the frame **57** a corporate directory search window in which the subscriber can enter search criteria to locate information for anyone in the directory. Such information is then displayed by the web page manager **36** in the frame **57**, for example in a similar manner to the display of the subscriber's personal directory in this frame as described above and illustrated in FIG. **3**. As in that situation and the other situations described above, the subscriber can scroll through the directory information, click on any record to reproduce it in the windows **68**, click on the ADD button **72** to add a corresponding record to the subscriber's personal directory, click on the DIAL button **75** to establish a call to the selected number, etc.

Other directories can also be accessed by the subscriber via the web facility **22**. For example, a national telephone directory, containing names, addresses, and telephone numbers, maintained elsewhere on the web **20** can be used by the subscriber by clicking on the button **65** labelled NATIONAL. In response to this the web page manager establishes an http (hypertext transfer protocol) link via the web **20** to the web site of the national directory in a known manner, and presents its search window to the subscriber in the frame **57**. As in the case described above, the subscriber can then find information using the national directory, copy and paste it or click on it to reproduce it in the windows **68**, and add the information to the subscriber's personal directory by clicking on the ADD button **72**, dial the number by clicking on the DIAL button **75**, etc. Other directories external to the web facility **22** can be similarly accessed.

The subscriber can also click on the button **66** labelled PREFS., in response to which the web page manager **36** presents in the frame **57** options for the subscriber to set preferences for his use of the web facility **22** in a known manner.

It will be apparent to those of ordinary skill in the art that all of the above functions, and many other functions which may be desired, can be provided in a relatively straightforward manner by simple messages or procedure calls and responses, with appropriate parameters and returned values, between functions of the web facility **22**, and specifically between the web page manager **36** and the call control interface **46**, cache **40**, and database **42** via the CGI scripts **38** and the call APIs **44**. Details of these procedures, parameters, and returned values depend on the particular functions that are provided and the particular manner in which the web facility **22** is implemented. Such details can be routinely determined by persons of ordinary skill and knowledge, and accordingly need not be, and are not, described here.

A number of significant advantages that may not be immediately apparent can be provided by embodiments of the invention. It can be appreciated that a subscriber can use any web browser **12** and any telephone **10** to provide all of the functions which are available via the web facility **22**. Neither of these is required to have any special hardware or software features, beyond very basic capabilities of the telephone **10** and the inherent functioning of the web browser **12**. The subscriber does not need to acquire or maintain any other software or hardware.

The subscriber is able to access his telephone web page on the web facility **22** from any web browser at any location. This enables all of his call management functions to be available to him regardless of where he may be, for example at home, in an office, or travelling using a mobile telephone and web browser. A particular advantage of this is provided if one of the telephone functions available to the subscriber is call forwarding. In this case for example the subscriber can access the web facility **22** from his office, activate via the web facility **22** a call fowarding function which causes the telephone switch **16** to redirect to his office telephone number calls that are directed to his home telephone number, and receive such calls at his office. Conversely, on returning home he can again access the web facility **22** to remove the call forwarding. The web facility **22** controls the telephone switch to effect and remove the call forwarding function in a similar manner to that described above for call transfer, using another button and related procedures to perform these functions.

Numerous other communications functions can be similarly and easily provided in a corresponding manner, and as already stated, the above description is given purely by way

of illustration of the functions that may be provided. As can be appreciated, further functions (both known and yet to be developed) can be easily added by the web facility **22**, and these can be made available immediately to the subscriber, possibly on a subscription or pay-per-use basis that enhances revenues to the service provider. Obviously, the same web facility can be used to serve an arbitrary number of subscribers.

Thus although a particular form of the invention has been described above, it can be appreciated that numerous modifications, variations, and adaptations may be made without departing from the scope of the invention as defined in the claims.

What is claimed is:

1. A method of making a telephone connection comprising the steps of:

storing, for access by a computer network facility which is remotely accessible using a web browser, telephone number information relating to a telephone subscriber;

remotely accessing the computer network facility using a web browser for display of said telephone number information to the subscriber;

producing at the computer network facility using the web browser a telephone connection message including information identifying a calling telephone number of the subscriber and a called telephone number;

communicating the telephone connection message from the computer network facility to a telephone switch via a switch-computer interface; and

establishing a telephone connection between the calling and called telephone numbers from the switch in response to the telephone connection message.

2. A method as claimed in claim **1** wherein the step of establishing a telephone connection comprises the step of providing a ringing signal to a telephone identified by the calling telephone number.

3. A method as claimed in claim **1** wherein the telephone number information comprises a personal telephone directory of the subscriber.

4. A method as claimed in claim **1** wherein the telephone number information comprises logged information relating to telephone communications to and/or from the calling telephone number.

5. A method as claimed in claim **1** and further comprising the step of:

communicating information relating to telephone communications to and/or from the calling telephone number from the switch to the computer network facility;

wherein said telephone number information includes said information communicated from the switch.

6. A method as claimed in claim **5** wherein the telephone number information includes personal telephone directory information of the subscriber.

7. A method as claimed in claim **6** wherein the step of establishing a telephone connection comprises the step of providing a ringing signal to a telephone identified by the calling telephone number.

8. A telephone call management system comprising:

a computer network facility including a web server for communications with web browsers of telephone subscribers, an information database for storing telephone number information relating to the subscribers, and a telephone call control system;

a telephone switch including a switch-computer interface; and a communications path between the telephone call control system of the computer network facility and the switch-computer interface of the telephone switch;

wherein information relating to telephone communications to and/or from telephone numbers of subscribers is communicated via the communications path from the telephone switch to the computer network facility and is stored in the database for the respective subscribers, and information for controlling telephone communications is communicated via the communications path from the computer network facility to the telephone switch in response to remote access by the respective subscribers to the information database via web browsers of the respective subscribers and the web server of the computer network facility.

9. A system as claimed in claim **8** wherein information stored in the database comprises telephone numbers calling and/or called by the telephone subscribers.

10. A system as claimed in claim **9** wherein information stored in the database further comprises personal telephone directories of the telephone subscribers.

11. A system as claimed in claim **8** the information for controlling telephone communications communicated from the computer network facility to the telephone switch comprises information identifying a telephone number of a subscriber remotely accessing the server of the computer network facility and information identifying a telephone connection request and another telephone number associated with the request.

12. A method of telephone call management, comprising the steps of:

storing personal telephone directories and call logs of telephone subscribers for remote access by the subscribers via a web facility;

supplying information, relating to at least some telephone communications associated with the telephone subscribers, from a telephone switch to the web facility;

updating the personal telephone directories and call logs of the telephone subscribers in dependence upon information supplied by the subscribers by the remote access via the web facility and the information supplied from the telephone switch; and

supplying information from the web facility to the telephone switch, for controlling telephone communications for the subscribers via the telephone switch, in response to the remote access by the subscribers via the web facility.

13. A method as claimed in claim **12** wherein the information supplied from the telephone switch to the web facility identifies calling and called telephone numbers of the telephone subscribers.

14. A method as claimed in claim **12** wherein the information supplied from the web facility to the telephone switch identifies subscriber telephone numbers and connection requests identified by the subscribers by the remote access via the web facility.

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